

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 10/530,663
Applicant : Noriharu Kojima et al.
Filed : April 6, 2005
Patent No. : 7,142,824
Issue Date : November 28, 2006
Title : ANTENNA DEVICE

Conf. No. : 7642
TC/A.U. : 2821
Examiner : William D. Cumming

Customer No. : 000,116
Docket No. : 38052

LETTER REGARDING PATENT PRINTING ERRORS

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

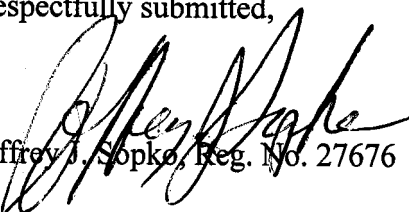
In proofreading the referenced patent, typographical errors were noted. It is not believed that these errors require a Certificate of Correction. However, it is respectfully requested that this letter, along with the supporting documentation, be placed in the file for this case.

The following errors were noted:

In Column 9, Line 44, please delete --WCBMA-- and insert --WCDMA--.

In Column 13, Line 41, please delete --comprised-- and insert --composed--.

Respectfully submitted,


Jeffrey J. Sopko, Reg. No. 27676

1801 East 9th Street, Suite 1200
Cleveland, OH 44114-3108
216.579.1700

July 30, 2007

DCS1800 received signals which are received waves of the second frequency band are received by the first antenna 1 and, as high-frequency signals including signals of the second and third frequency bands by the diplexer 3, the signals reach a second high-frequency switch circuit 5. The
5 second high-frequency switch circuit 5 selects the DCS1800 receiver 17 when receiving DCS1800 signals of the second frequency band.

In addition, DCS1800 transmitting signals which are transmitting waves of the second frequency band are transmitted from the DCS1800 transmitter 18, and, after a higher harmonic component is reduced by a
10 lowpass filter 14, during a transmission, the signals are radiated from the first antenna 1 via the second high-frequency switch circuit 5 and diplexer 3 connected to the DCS1800 transmitter 18 side.

WCDMA signals which are transmitting and receiving waves of the third frequency band can be transmitted and received by selecting either the
15 first antenna 1 or second antenna 2. Signals transmitted and received by the first antenna 1 reach, as high-frequency signals including signals of the second and third frequency bands by the diplexer 3, the second high-frequency switch circuit 5. The second high-frequency switch circuit 5 is connected, when transmitting and receiving WCDMA signals, to a third high-frequency switch
20 circuit 6, and furthermore, the third high-frequency switch circuit 6 is connected to the second high-frequency switch circuit 5, and transmission and reception by a WCDMA transmitter/receiver 19 become possible.

In addition, when WCDMA signals are transmitted by the second antenna 2, the second antenna 2 is selected by the third high-frequency switch
25 circuit 6, and signals of the WCDMA transmitter/receiver 19 are transmitted

and a transmission of signals of the third frequency band can be simultaneously carried out. Furthermore, for the third frequency band, antenna diversity can be used, and in this case, a dual-mode/multi-band antenna device which can also use an external antenna in place of the first antenna 20 can be simply provided.

(Seventh Embodiment)

Fig. 7 is a diagram showing a construction of radio communications equipment to which an antenna device of a seventh embodiment has been applied. The antenna device of the seventh embodiment is, in addition to having the same construction as that of the fifth embodiment, provided with, at an output side of a first frequency transmitter 24 for transmitting signals of a first frequency band and at an output side of a second/fourth frequency transmitter 8 for transmitting signals of the second/fourth frequency band, lowpass filters 13 and 25 to suppress their respective higher harmonics. The construction and operations except for these lowpass filters 13 and 25 are the same as those of the fifth embodiment.

Namely, since output signals of the first frequency transmitter 8 and output signals of the second/fourth frequency transmitter 24 and transmitted from the first antenna 20 while respective higher harmonic components thereof are suppressed, for the first frequency band and second frequency band, an antenna device for transmitting signals whose higher harmonic components have been reduced can be provided.

As such, according to the seventh embodiment, two antenna systems corresponding to four frequency bands composed of a conventional tri-band